(12) UK Patent Application (19) GB (11) 2 262 123 (13) A

(43) Date of A publication 09.06.1993

(21) Application No 9216838.4

(22) Date of filing 07.08.1992

(30) Priority data
(31) 03347683 (32) 04.12.1991 (33) JP

(51) INT CL[5]
E06B 3/44

(52) UK CL (Edition L)
E1J JFA

(56) Documents cited
None

(58) Field of search
UK CL (Edition K) E1J JFA
INT CL[6] E06B

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(54) Sash window counter balance

(57) A window is constructed such that a window sash may be slid upwardly and downwardly along a side jamb 4 of a window, and also may be inclined relative to the side jamb. This window is hung by a counter balance (7, Fig. 1) and held at a desired position. The counter balance is provided with a coiled torsion spring 15 which counter balances with the window sash, and the torsion force of the torsion spring can be adjusted by an adjusting means. The adjusting means is provided with an adjusting shaft 32 for adjusting the torsion force of the torsion spring, braking member 54 applying braking force to the adjusting shaft to prevent the rotation of the shaft, and a cam face 51 for pushing the braking member against the adjusting shaft or releasing it.

FIG. 3

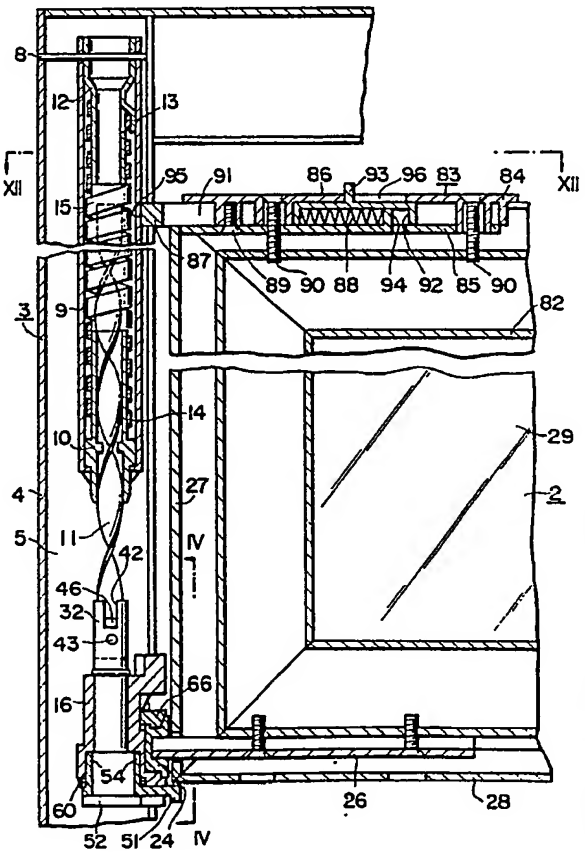

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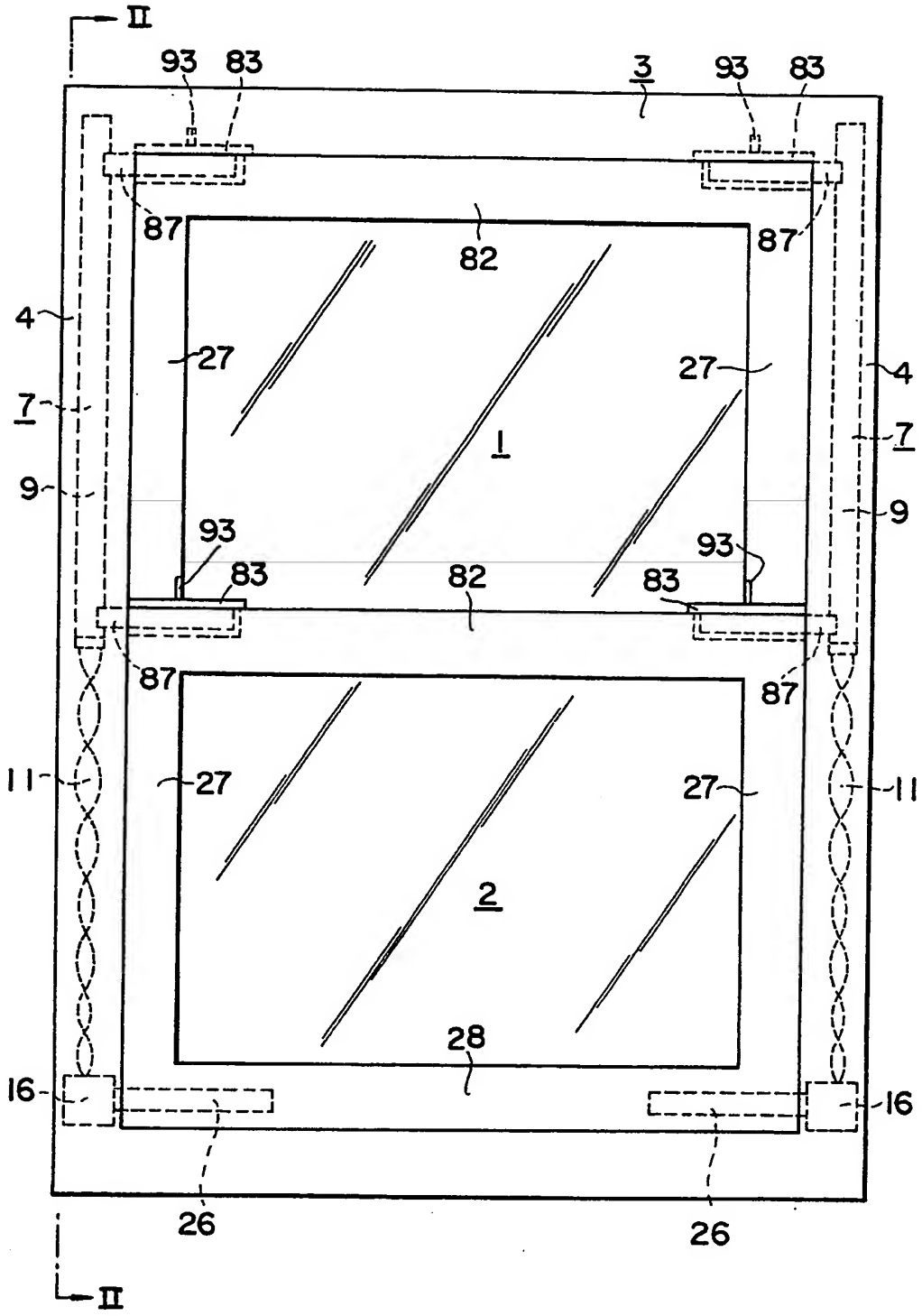
FIG. 1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2
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16
16
26
26
II

FIG. 2

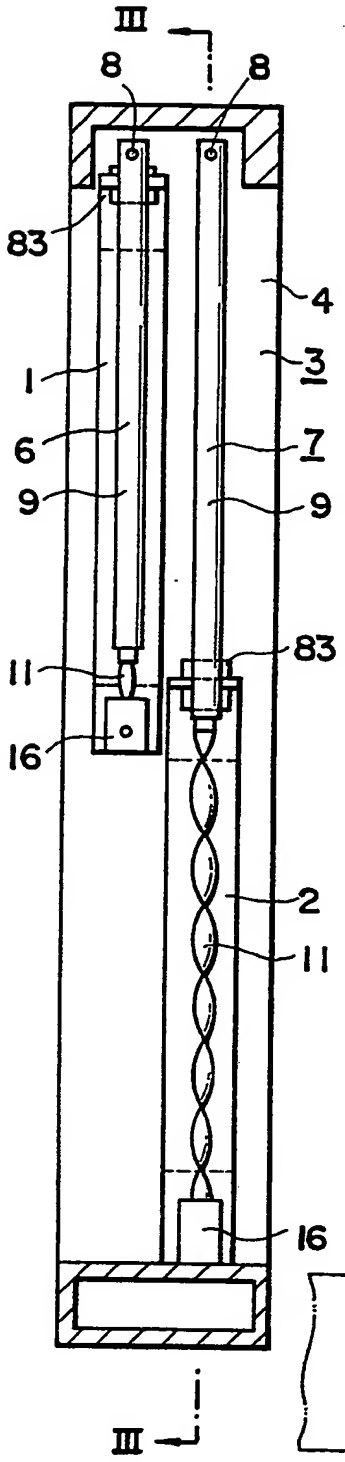


FIG. 4

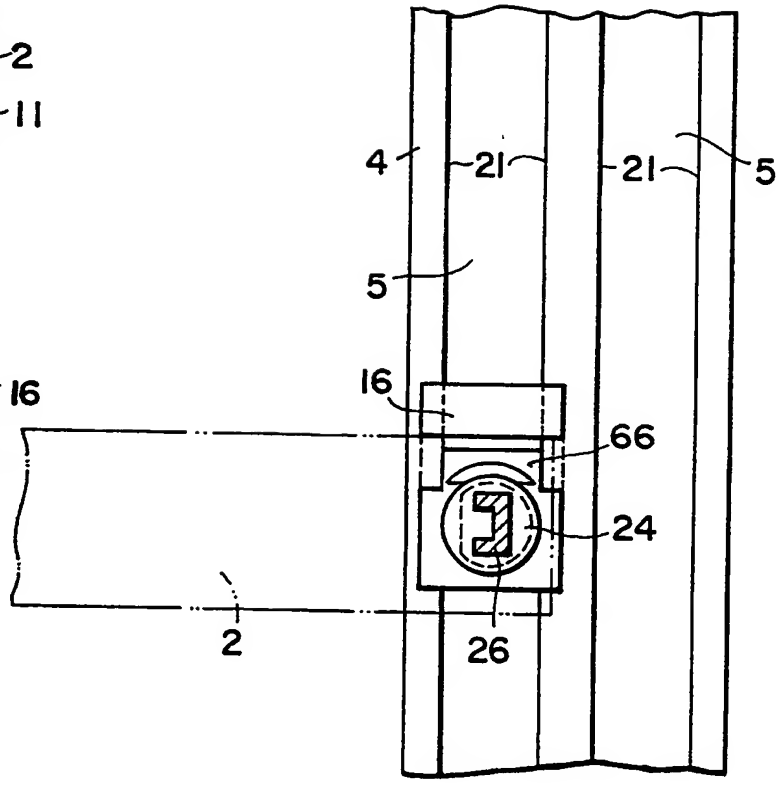
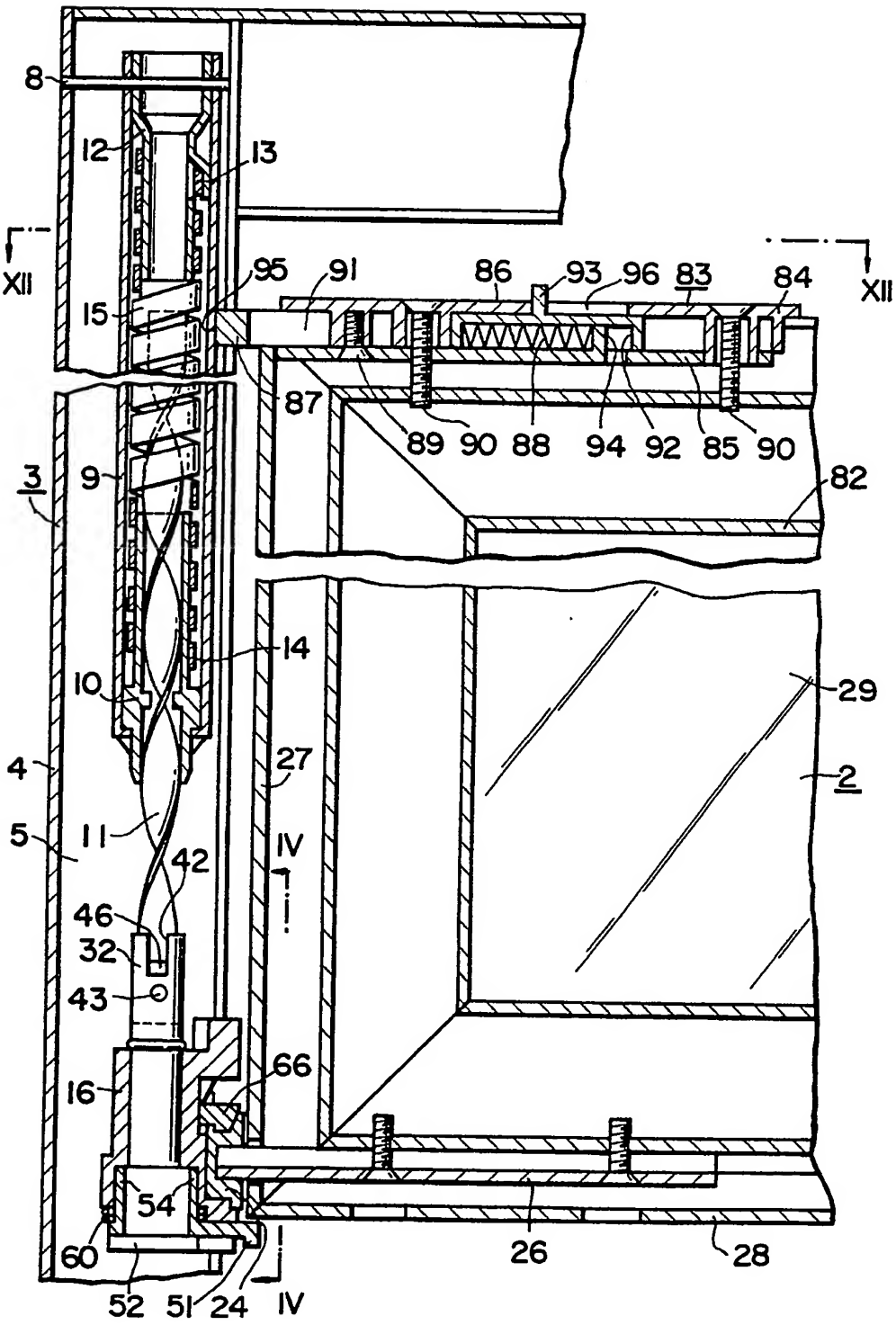


FIG. 3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12
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XII
15
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86
93
96
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XII
87
89
90
88
94
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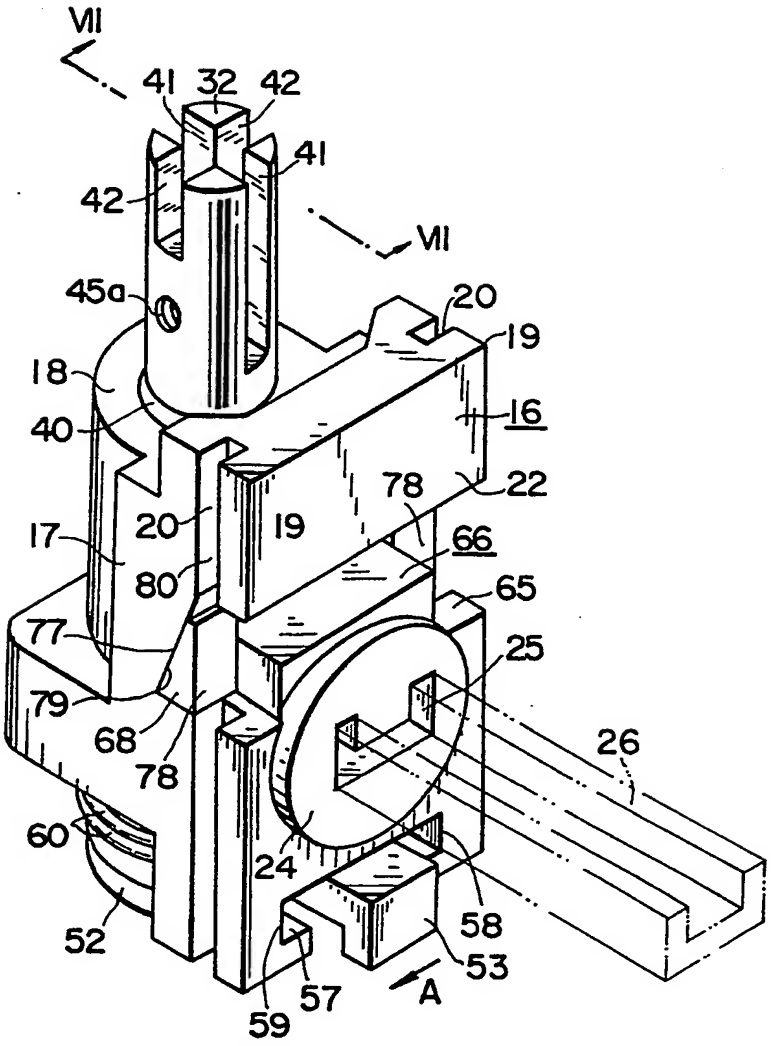
85
90
3
9
82
14
10
29
27
4
2
5
11
IV
42
46
32
43
66
16
54
60
52
51
24
IV
26
28

FIG. 5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41
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42
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45a
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68
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26
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58
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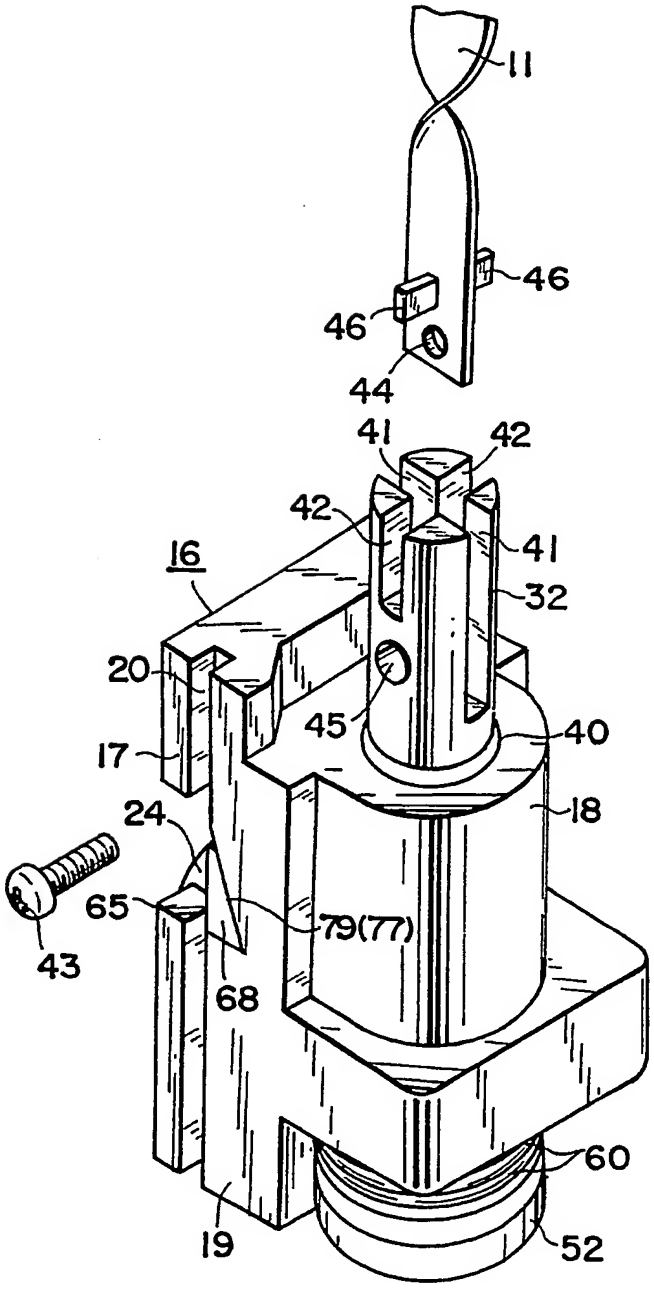
57
A
59

FIG. 6



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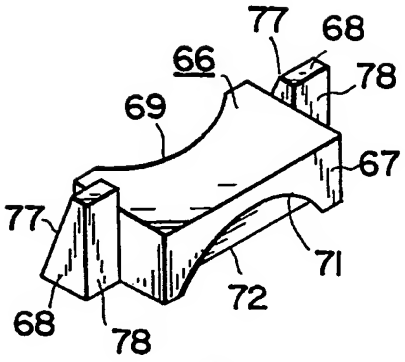
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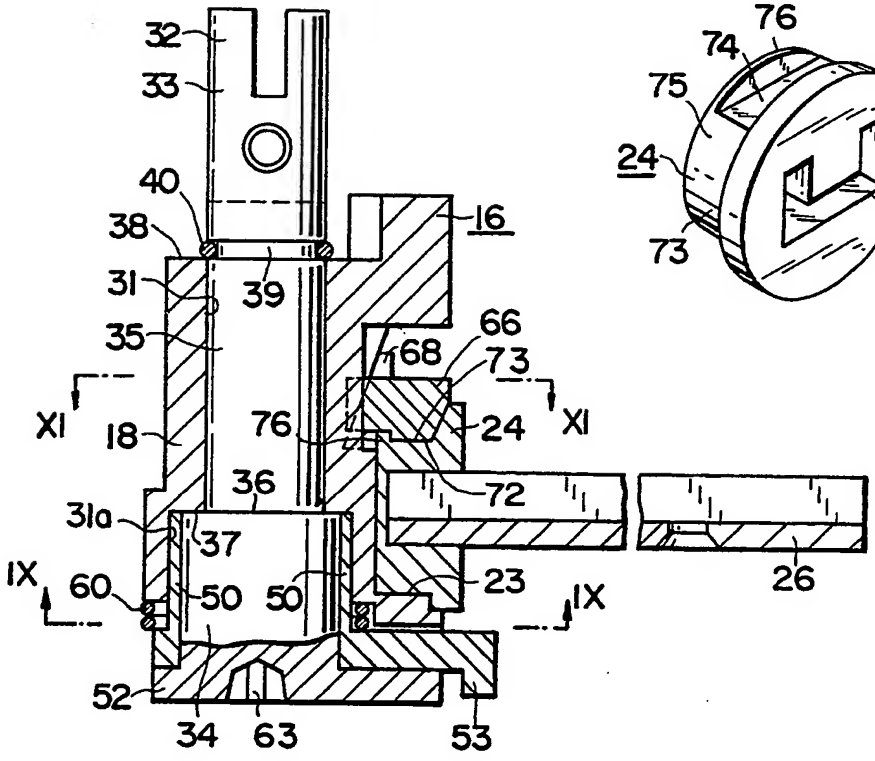
FIG. 7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16
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39
35
66
68
73
XI
XI
18
76
24
36
72
31a
37
IX
IX
60
50
50
23
26
52
34
63
53

76
74
70
75
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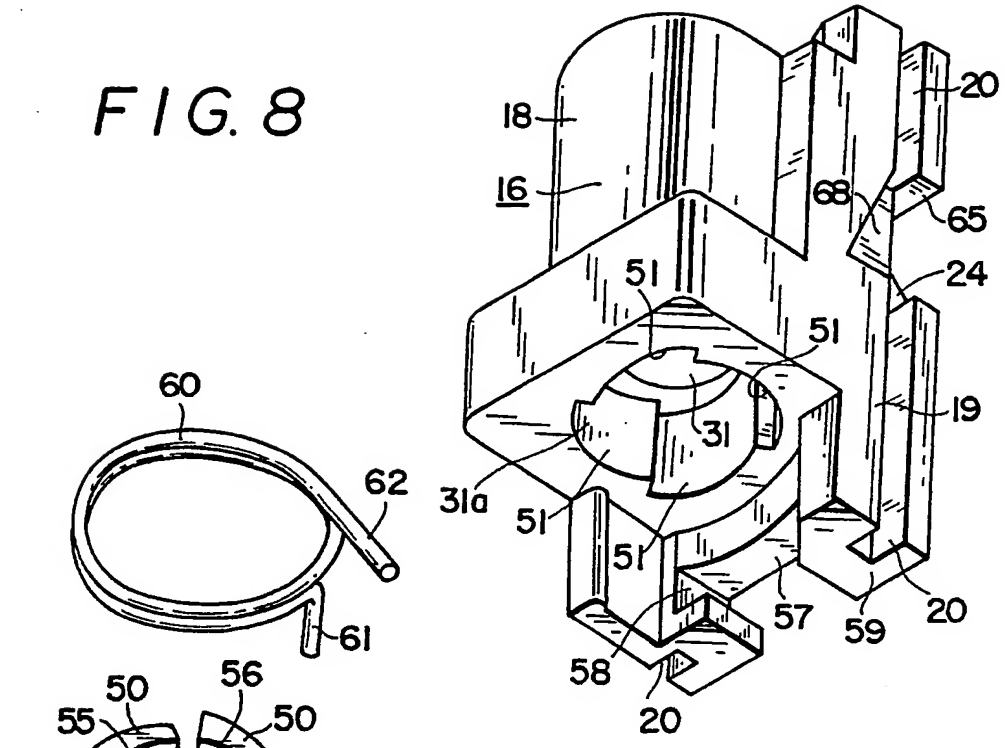
25
73

FIG. 8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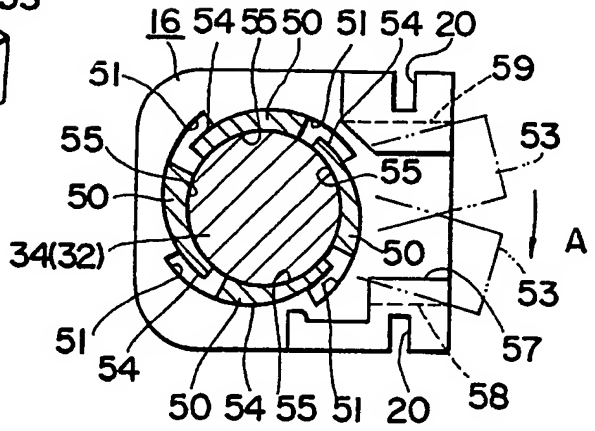
52
A

FIG. 9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20
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A
34(32)
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54
58
50
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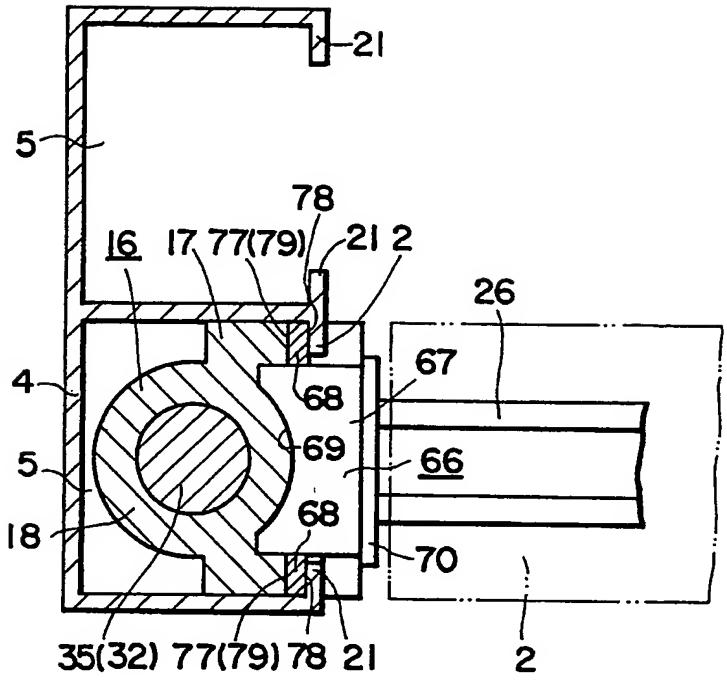
55
51
20

FIG. 11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17
77(79)
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35(32)
77(79)
78
21
2

FIG. 12

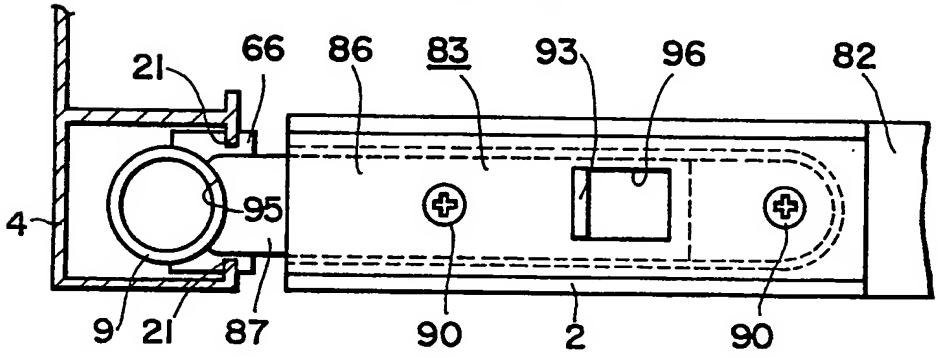
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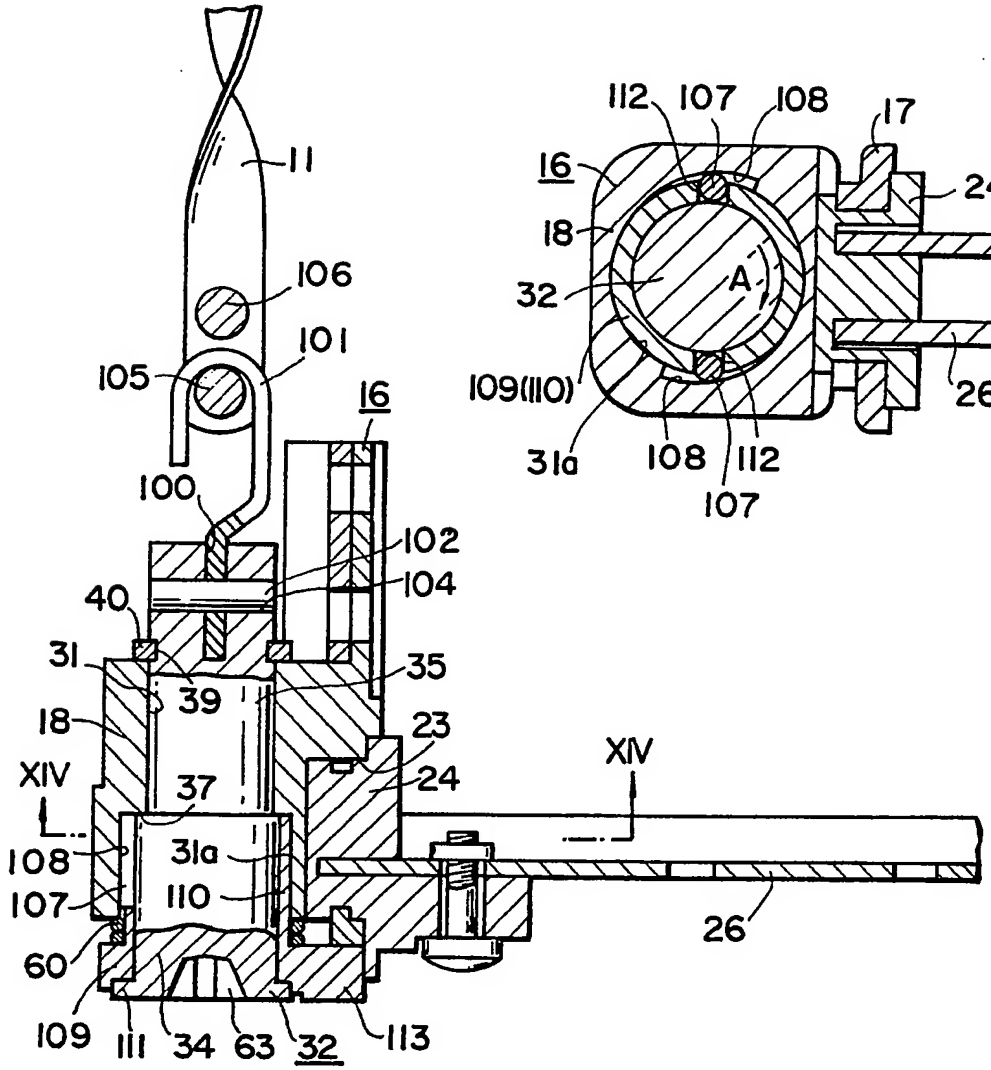
FIG. 13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16
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39
35
18
23
XIV
37
24
108
31a
107
110
60
109
111
34
63
32
113
XIV
26

FIG. 14

112
107
108
17
16
24
18
A
32
109(110)
26
31a
108
112
107

FIG.15

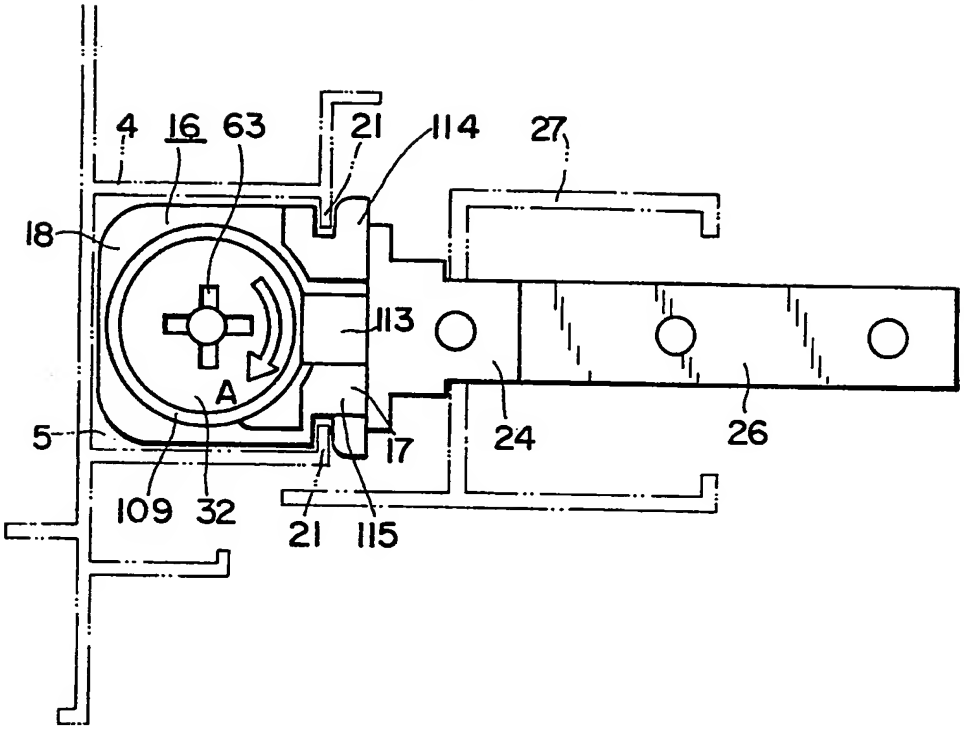
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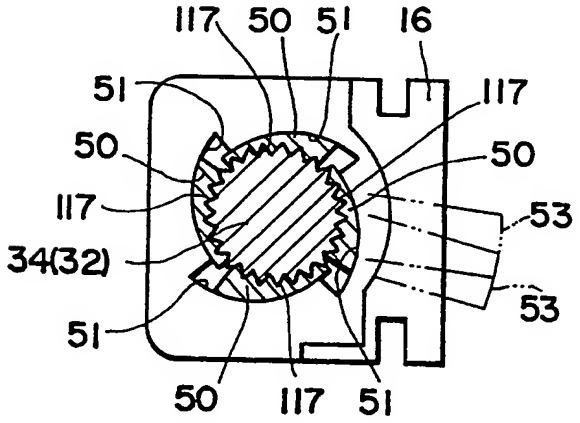
FIG.16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34(32)
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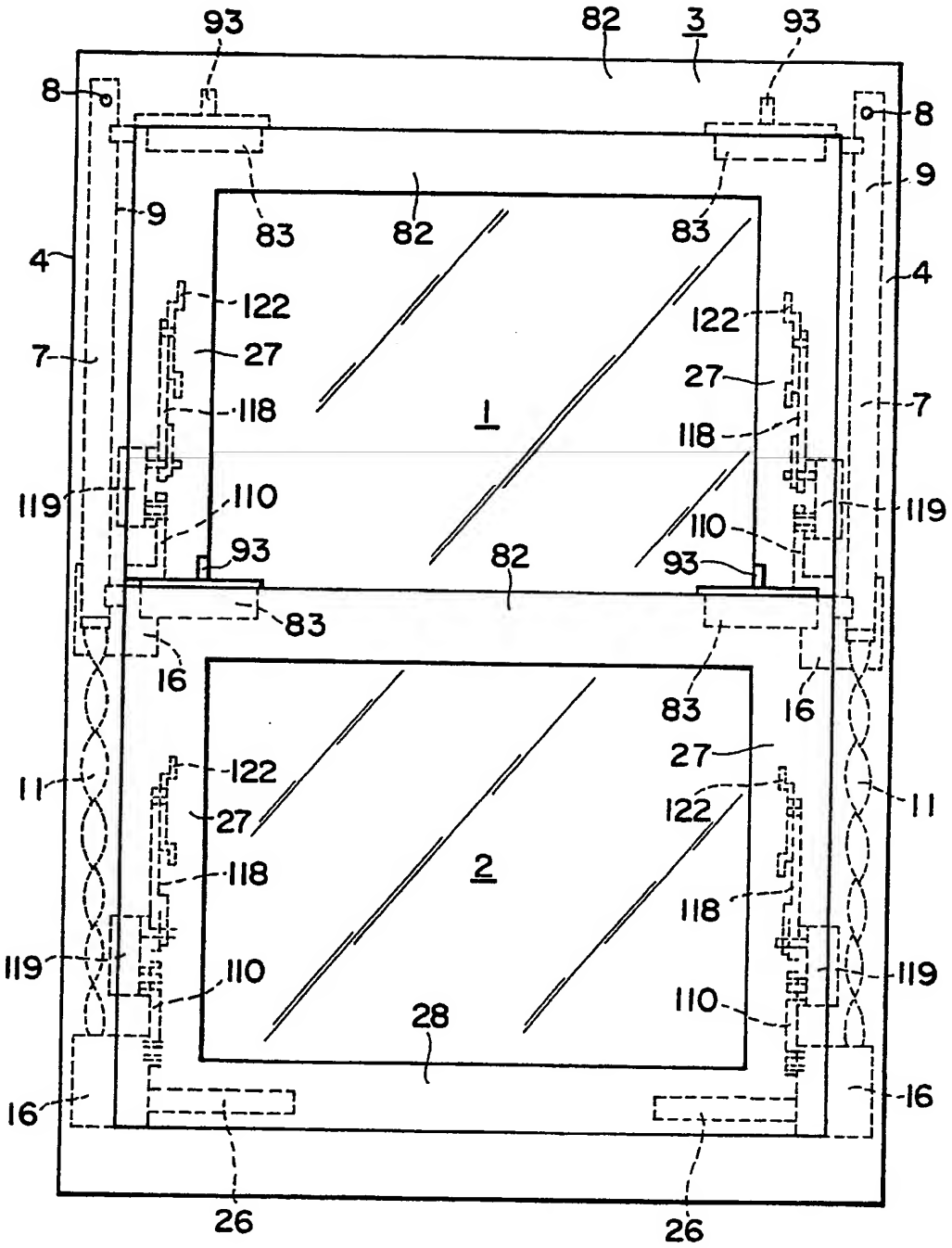
117
51

FIG.17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16
16
83
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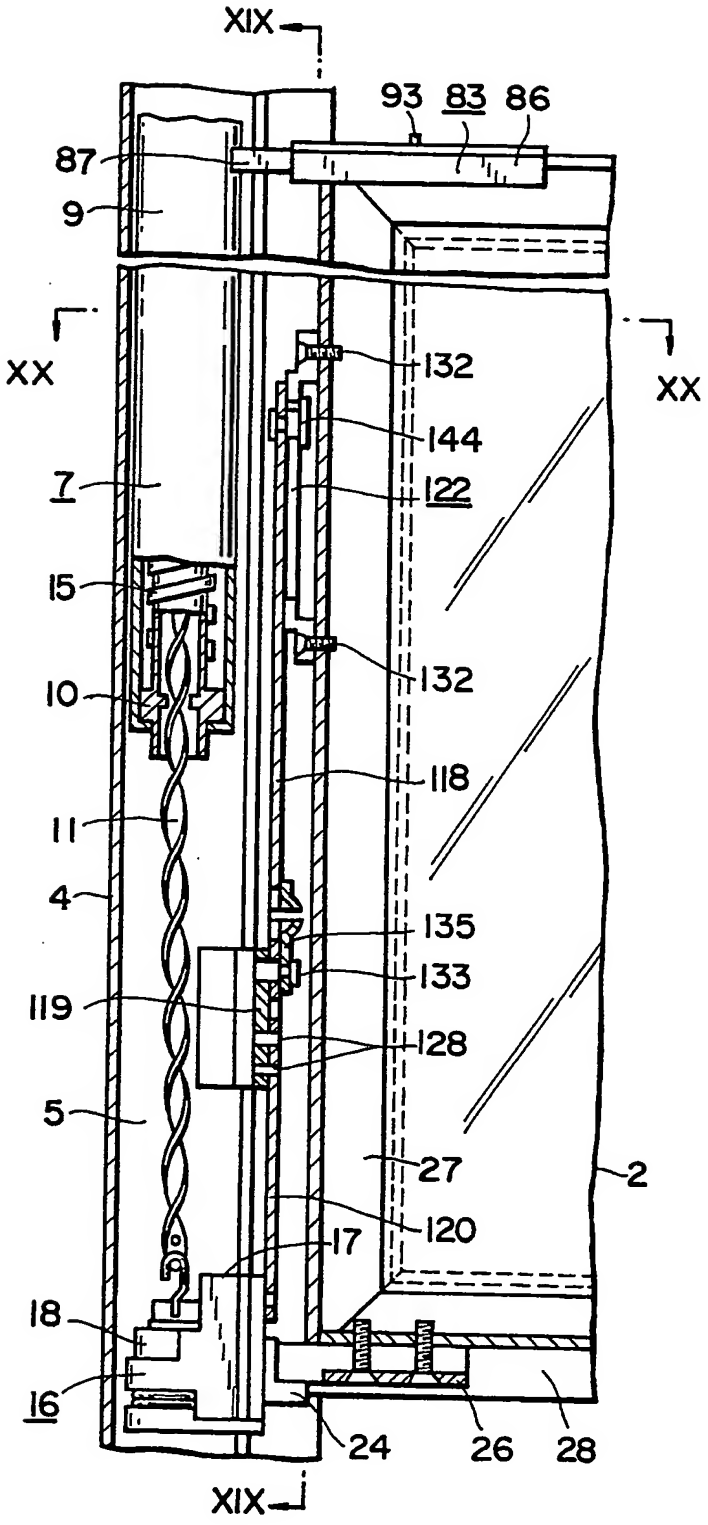
FIG. 18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9
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XX
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144
7
122
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132
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118
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128
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27
2
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17
18
16
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26
28
XIX

FIG. 19

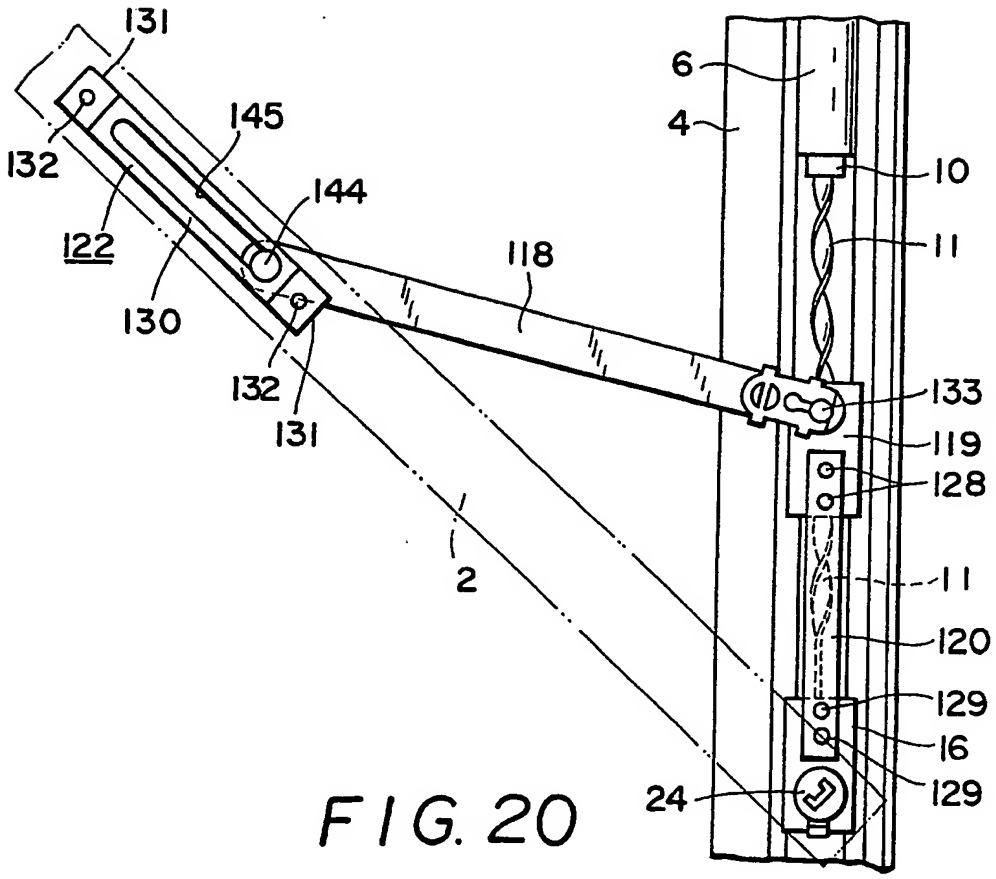
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FIG. 20

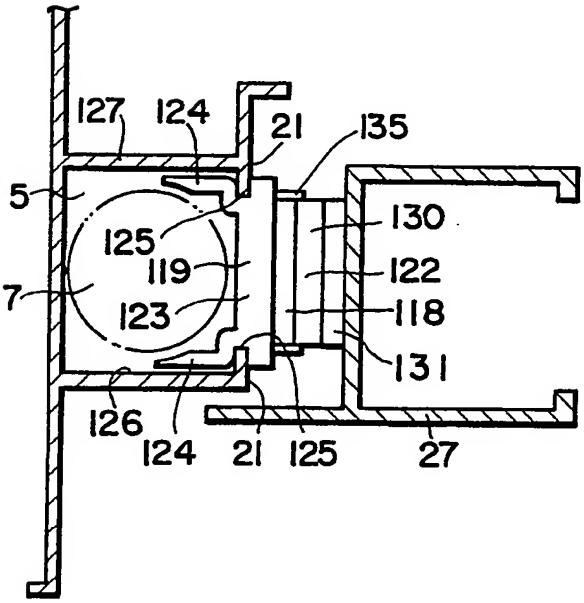
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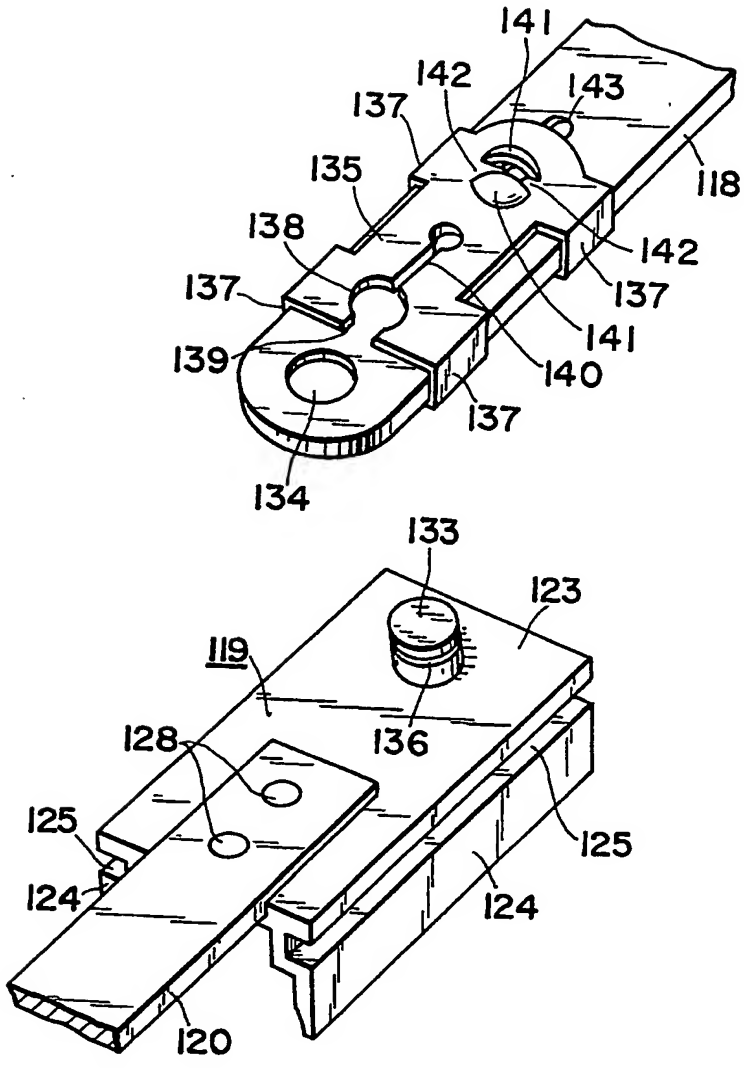
FIG. 21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128
125
125
124
124
120

WINDOW

The present invention relates to a window in which a window sash is slidable upwardly and downwardly along side jambs of a window frame, and adapted to downward swinging toward the inside of the window frame. In the prior art, a counter balance is employed to hold a window sash at a desired vertical position. It is known to use the torsion force of a coiled torsion spring for counter balancing with the window sash. To adjust the torsion force, there are known several mechanical structures wherein an adjusting shaft is constrained to rotate in one direction by a ratchet mechanism, or the braking force is applied to the adjusting shaft by the resilient force of a coiled brake spring.

The former system using the ratchet mechanism as mentioned above is convenient for winding the torsion spring, but inapplicable for unwinding it, whereby the torsion force cannot be adjusted properly. The latter system using the brake spring is applicable to the both of winding and unwinding of the torsion spring. However, due to the unreliability of the braking force of the brake and spring and reduction of the braking force by deterioration of the brake spring, the wound torsion spring naturally unwinds, which leads it becoming useless. Further, the operations of the torsion spring such as winding and unwinding are heavy and not made smoothly, and also the brake spring is not easily assembled.

Further, for a window in which the up-and-down slidable window sash is rotated from a vertical position to a horizontal position, there is known a counter balancing apparatus comprising a counter balancing means for the window sash, and a braking means for applying a

braking force to the window sash as the window sash is being inclined, to fasten it at the inclined position.

In this counter balancing apparatus, the counter balancing means has no adjusting means for the counter balancing force, and thus it is impossible to adjust the counter balancing means after the counter balancing means and the window sash are assembled in the window frame, or to adjust the fluctuation of the force by the counter balancing means during operation.

In addition, there is known a window in which a sliding member is mounted on a side jamb of a window frame in an up-and-down slidable fashion, the sliding member is connected to the lower end of the window sash with a horizontal shaft such that the window sash can be swung inwardly in a horizontal direction, each of both sides of the window sash is connected to the sliding member with an arm to hold the window sash at a desired rotation angle in an inward direction, and a counter balancing means is disposed to hang the sliding member therefrom to hold the sliding member at a desired height.

The above arm is already connected undetachably to both of the window sash and the sliding member which is slidable up-and-down within the side jamb of the window frame when such a window is carried from a factory, and thus it is unavoidable to transport the window under the condition that the window is mounted on the window frame; however, this is inconvenient. Further, the counter balancing means cannot be replaced readily after installation of the window, the downward swingable angle of the window sash toward the inside is restricted to a small angle with a view to crime prevention, and when the area of the window sash is large the outside face of the window sash cannot be cleaned readily.

It is an object of the present invention to provide a window provided with a counter balancing apparatus having a counter balancing means for an up-and-down slidable window sash, wherein adjustment of the counter balancing force is made securely, readily and smoothly.

It is another object of the present invention to provide a window provided with a counter balancing apparatus wherein the counter balancing force is maintained securely for a long period of time.

It is still another object of embodiments of the present invention to provide a window provided with a counter balancing apparatus wherein adjustment of the counter balancing means is made under the condition that the window sash and the counter balancing means are assembled in a window frame.

It is a further object of embodiments of the present invention to provide a window provided with a convenient counter balancing apparatus wherein a braking force is automatically applied to the window sash as the window sash is being inclined, whereby the counter balanced state of the window sash is maintained.

It is a still further object of embodiments of the present invention to provide a window which is readily transported to a site for installation from a factory while the window sash and the window frame are separated.

It is another object of embodiments of the present invention to provide a window wherein the counter balancing means is readily replaced even after installation of the window sash.

It is still another object of embodiments of the present invention to provide a window wherein the outside

face of the window sash is cleaned readily even though the downward swinging angle of the window sash is restricted to a small angle.

It is a further object of the present invention to provide a window provided with a counter balancing apparatus in which the construction is simple, and the manufacturing and assembling are facilitated.

Accordingly, the invention provides a window comprising a window frame having a head and a sill which are oppositely disposed, and side jambs which are oppositely disposed; a window sash which slides upwardly and downwardly along the side jambs of the window frame; a counter balance having a coiled torsion spring which counter-balances with the window sash and keeps the window sash at a desired position; a first sliding block which connects the counter balance to the window sash and slides upwardly and downwardly along the side jambs of the window frame; and an adjusting means which is incorporated in the first sliding block and adjusts the counter balancing force of the torsion spring;

wherein the adjusting means comprises an adjusting shaft, a braking member disposed around the adjusting shaft and a cam face disposed around the braking member, so that the adjusting shaft adjusts the counter balancing force by torsioning the torsion spring, the braking member maintains the counter balancing force by applying a braking force to the adjusting shaft, and when the braking member rotates around the adjusting shaft in a circumferential direction, the cam face applies a braking force by pushing the braking member against the adjusting shaft and releases the braking force by separating the braking member from the adjusting shaft.

The counter balancing apparatus may further comprise a braking means for braking automatically the

sliding block as the window sash is being inclined forward or rearward. Further, an arm which maintains the window sash at a predetermined angle, may be detachably connected to a second sliding block which is slidable within a side jamb of the window frame.

Embodiments of the invention are described below, by example only, with reference to the accompanying drawings, in which:

Fig. 1 is a front elevation view of a window embodying the present invention.

Fig. 2 is a sectional view taken along line II-II of Fig. 1.

Fig. 3 is a sectional view taken along line III-III of Fig. 2, wherein an inner window sash is drawn upwardly to a raised position.

Fig. 4 is a sectional view taken along line IV-IV of Fig. 3, showing the condition of the inner window sash being downwardly swung to the inside.

Fig. 5 is a perspective view from the right hand side, showing the assembled condition of a first sliding block, an adjusting means of a torsion spring, and a braking means for the first sliding block.

Fig. 6 is a perspective view shown from the left hand, showing the assembled condition of a first sliding block, an adjusting means of a torsion spring, and a braking means for the first sliding block.

Fig. 7 is a sectional view taken along line VII-VII of Fig. 5.

Fig. 8 is an exploded perspective view showing an adjusting means for the torsion spring.

Fig. 9 is a sectional view taken along line IX-IX of Fig. 7.

Fig. 10 is an exploded perspective view showing a braking means for the first sliding block.

Fig. 11 is a sectional view taken along line XI-XI of Fig. 7.

Fig. 12 is a sectional view take along line XII-XII of Fig. 3.

Fig. 13 is a sectional view similar to Fig. 7, showing another example.

Fig. 14 is a sectional view taken along line XIV-XIV of Fig. 13.

Fig. 15 is a bottom end view of Fig. 13.

Fig. 16 is a sectional view similar to Fig. 9, showing another example.

Fig. 17 is a front elevation view of a window, showing another example.

Fig. 18 is a sectional view similar to Fig. 3, showing the window sash of Fig. 17.

Fig. 19 is a sectional view taken along line XIX-XIX of Fig. 18, showing the condition of the window sash of Fig. 17 being opened.

Fig. 20 is a sectional view taken along line XX-XX of Fig. 18.

Fig. 21 is a perspective view showing a connecting means for the second sliding block and the arm in the present invention.

An outer window sash 1 and an inner window sash 2 move upwardly and downwardly along guide grooves 5, 5 of side jambs 4 of a window frame 3 (Fig. 11). The outer window sash closes the upper portion of a window and the inner window sash closes the lower portion of the window. Respective window sashes 1, 2 are hung within the side jambs 4 under the counter balanced condition by counter balances 6, 7 used as counter balancing means (Fig. 2), respectively, whereby the sashes are held at a desired height. Respective window sashes 1, 2 are permitted to rotate toward the inside of a room at a predetermined angle. Hereinafter, description will be made mainly with respect to the inner window sash 2.

The counter balances 6, 7 have the same structures

although the dimensions thereof are different from each other such that each of them may adapt to the inner or outer sash 1 or 2, and the following description will be made mainly with respect to the counter balance 7 for the inner sash 2.

The counter balance 7 is provided with: a tube 9 extending in upper and lower directions, wherein the upper end is connected to the side jamb 4 by means of a pin 8 (Fig. 2 and Fig. 3); a nut 10 connected to the lower end of the tube in such a manner that the nut is permitted to be only rotatable; spiral member 11 up-and-down movably inserted into the tube, the lower end of the spiral member passing through the nut 10 in an engaging manner and projecting outwardly from the lower end of the tube 9; and a coiled torsion spring 15 having an upper end 13 winding around the spiral member 11 within the tube 9 and being fixed to the tube 9 with a spring lock member 12, and a lower end 14 being fixed to the nut 10. The spiral member 11 rotates the nut 10 with its downward movement to wind the torsion spring 15, and the wound torsion spring 15 rotates the nut 10 in a reverse direction with its unwinding force to raise the spiral member 11. The spiral member 11 is connected to the sashes 1, 2, and the torsion spring 15 is applied with a torsion force which counter balances with the sash 2 at its maximum raised position, whereupon the torsion spring 15 always counter balances with the sash, and thus holds the sash at a position of a desired height, and can move the sash upwardly and downwardly by a small force.

A first sliding block 16 is mainly comprised of a substantially rectangular portion 17, and a cylindrical portion 18 formed integrally with said portion 17, and is incorporated slidably within the guide groove 5 of the side jamb 4 of the window frame (Fig. 5, Fig. 6 and Fig. 8).

The rectangular portion 17 has sliding grooves 20 extending in upward and downward directions, formed on flat surfaces 19 parallel to each other at the both sides of the portion (Fig. 5). The sliding groove 20 is slidably fitted with a flange 21 at the aperture of the guide groove 5 of the side jamb 4 (Fig. 12 and Fig. 15) to move the sliding block 16 upwardly and downwardly along the guide groove 5.

The rectangular portion 17 also has a shaft supporting bore 23 disposed horizontally on a flat surface 22 which is perpendicular to the flat surfaces 19 at both sides of the portion (Fig. 7). The shaft supporting bore 23 supports rotatably a pivot shaft 24, and the pivot shaft 24 has a connecting opening 25 which is fitted with a connecting arm 26 such that the shaft is rotated integrally with the connecting arm 26 (Fig. 5). The connecting arm 26 is fixed to a bottom rail 28 of the sash 2 (Fig. 3), and the sash is inclined from the vertical position to the horizontal position toward the inside of the room around the pivot shaft 24 as its centre of rotation (Fig. 4). By this inclining movement, an outside surface of glass 29 of the sash 2 can be cleaned safely and easily inside of the room.

The cylindrical portion 18 has a shaft supporting bore 31 passing through in an up-and-down direction, and an enlarged opening 31a communicating with the shaft supporting bore 31 (Fig. 7). An adjusting shaft 32 used as an adjusting means for the torsion spring 15 is rotatably inserted into the shaft supporting bore 31 and the enlarged opening 31a, and a shaft portion 33 at the upper end of the adjusting shaft 32 projects upwardly from the cylindrical portion 18 and a part of a shaft portion 34 at the lower end projects downwardly from the cylindrical portion 18 (Fig. 7).

The adjusting shaft 32 is formed so as to have the same diameter from a shaft portion 35 at which it fits to the shaft supporting bore 31 of the cylindrical portion 18 to a shaft portion 33 at the lower end, but at a shaft portion 34 lower than the shaft supporting bore 31, has a larger diameter than the shaft supporting bore 31 and the shaft portion 35 (Fig. 7).

When the adjusting shaft 32 is inserted into the shaft supporting bore 31 from the lower section, a shoulder portion 36 between the shaft portions 34, 35 is caused to abut to a shoulder portion 37 between the shaft supporting bore 31 and the enlarged opening 31a to prevent the upward movement of the adjusting shaft 32 (Fig. 7). To an annular groove 39 of the adjusting shaft 32, located at the edge of an upper end 38 of the shaft supporting bore 31, a stop ring 40 is fitted, whereupon the downward movement of the adjusting shaft 32 is prevented. By this structure, the adjusting shaft 32 is assembled within the shaft supporting bore 31 in such a manner that it only rotates (Fig. 7).

The adjusting shaft 32 is provided with cross-shaped slits 41, 42 at its upper end (Fig. 5 and Fig. 6). Into the slit 41, the lower end of the spiral member 11 is inserted, and the shaft 32 and the member 11 are connected with a cross screw 43 whose head is screwed in a screw bore 45a through a bore 44 at the lower end of the spiral member and a bore 45 of the adjusting shaft 32. Into another slit 42, a pin 46 fixed to the spiral member 11 at a right angle thereto is inserted, and the pin 46 serves to register the positions of the bore 44 of the spiral member 11 and the bores 45, 45a of the adjusting shaft 32, and prevents the rotation of the spiral member 11 relative to the adjusting shaft 32. By this structure, the adjusting shaft 32 is hung from the spiral member 11, and hangs the sliding block 16, whereby

the sliding block 16 supports a sash 2 by way of the pivot shaft 24 and the connecting arm 26, and the sash 2 is hung by way of the counter balance 7 (Fig. 3).

An adjusting means for the torsion force of the torsion spring 15 of the counter balance 7 is provided with the above-mentioned adjusting shaft 32, as well as a braking members 50 imparting the braking force to the adjusting shaft 32, and cam faces 51 pushing said braking members 50 against the adjusting shaft 32 (Fig. 8).

For example, each of the braking members 50 is formed in an arcuate wedge shape, and four braking members are mounted integrally on a rotation ring 52 with equal intervals so that they surround the adjusting shaft 32, wherein a lever 53 extends in a radial direction from the rotation ring (Fig. 8).

Four cam faces 51 are formed with equal intervals on the inner periphery of the enlarged opening 31a of the sliding block 16 so that they correspond to the braking members 50 (Fig. 8). The cam faces 51 and outer faces 54 of the braking members 50 being in contact with the cam faces are formed into an arcuate shape wherein the radius increases in a peripheral direction, and the length of the arc at the outer surface 54 is shorter than that of the cam face 51, whereby sliding can occur with a play. Each of inner surfaces 55 of the braking members 50 is formed into an arcuate shape so that it can be brought into close contact with the peripheral surface of the shaft portion 34 of the adjusting shaft 32.

The braking members 50 are inserted into the enlarged opening 31a surrounded by the cam faces 51. The shaft portion 34 of the adjusting shaft 32 is inserted into an opening 56 surrounded by the braking members 50 and into the ring 52 (Fig. 8), and the lever 53 passes

through a slot 57 formed on the rectangular portion 17 of the sliding block 16 and projects outwardly from the flat surface 22 (Fig. 5).

The lever 53 is slidable between end portions 58, 59 of the slot 57 (Fig. 5). When the lever 53 abuts an end portion 58 of the slot 57 (Fig. 9), the outer surfaces 54 of the braking members 50 are not pushed against the cam faces 51, and the braking members are under a neutral condition. Thus, the inner surfaces 55 of the braking members 50 are not pushed against the adjusting shaft 32 and the adjusting shaft 32 is under a condition free from a braking force. Further, when the lever 53 is rotated to the position where the lever abuts the other end portion 59 of the slot 57 in a direction opposite to the arrow A, the outer surfaces 54 of the braking members 50 are pushed by the cam faces 51, whereby the adjusting shaft 32 is clamped torsionally by the inner surfaces 55 of the braking members 50, thus being in the braking condition (Fig. 9).

A coiled torsion spring 60 is wound around the outer periphery of the braking members 50 (Fig. 7), and has an end portion 61 hooking the lever 51 and another end portion 62 hooking the end portion 58 of the slot 57 (Fig. 8), to apply a rotation force to the braking members 50 in the direction of braking (direction opposite to the arrow A), thereby maintaining the braking condition of the adjusting shaft 32 (Fig. 9).

The adjusting member 32 has a slot 63 at the lower end, and the head of a screwdriver is inserted into the slot 63 for rotation. When the adjusting shaft 32 is turned clockwise (direction of the arrow A), the torsion force of the torsion spring increases, and when turned counter-clockwise (direction opposite to the arrow A), the torsion force decreases.

The adjustment of increasing the torsion force of the torsion spring 15 is made as described below. Under the condition of Fig. 9, namely the condition wherein the braking members 50 are in close contact with the shaft portion 34 of the adjusting shaft 32 and the cam faces 51, when the adjusting shaft 32 is rotated clockwise (direction of the arrow A) the braking members 50 are also rotated in a circumferential direction to remove the braking force. Consequently, the adjusting shaft 32 is rotated clockwise to wind up the torsion spring 15. When the torsion spring 15 is wound up to a predetermined amount, the manual force for rotating the adjusting shaft 32 in a winding-up direction, is removed, whereupon the adjusting shaft 32 is returned slightly counter-clockwise (direction opposite to the arrow A) by the torsion spring 15, and at the same time the braking members 50 rotate in the same direction to apply a braking force against the adjusting shaft, thereby preventing the rotation in the return direction.

The adjustment of decreasing the torsion force of the torsion spring 15 is made as described below. Under the condition of Fig. 9, while preventing the counter-clockwise rotation (direction opposite to the arrow A) of the adjusting shaft 32 by a manual force, the lever 53 is rotated from the end portion 59 of the slot 57 toward the end portion 58 to remove the braking force of the braking members 50. Under this condition, the manual force acting on the adjusting shaft 32 is decreased, whereupon the adjusting shaft 32 is gradually rotated counter-clockwise by the force of the spring 15 to decrease the force of the spring 15. When the force of the spring 15 is decreased to a predetermined amount, the lever 53 is returned to the end portion 59 of the slot 57 by the spring 60, whereupon the braking force of the braking members 50 acts on the adjusting shaft 32 to prevent the rotation of the adjusting shaft.

The unwinding of the torsion spring 15 may be made only by removing the braking force against the adjusting shaft 32 by the operation of the lever 53. As described above, the torsion force of the torsion spring 15 is adjusted so that it may properly counter balance with the sash.

The following description will be made with respect to a second braking means which imparts automatically a braking force as the window sash is being inclined to hold the inclined window sash in position at a desired height.

The second braking means is mainly comprised of a braking shoe 66 and the pivot shaft 24 which rotates said braking shoe (Fig. 5), and these members are incorporated within the first sliding block 16 as described below.

For this incorporation, the first sliding block 16 has a transverse slot 65 formed on a flat surface 22 of the rectangular portion 17 (Fig. 5), the both ends of the slot 65 are opening on the flat surfaces 19 of both sides of the sliding block 16, and the centre part of the slot 65 communicates with the shaft supporting bore 23 (Fig. 9). The brake shoe 66 is inserted into the transverse slot 65 and the pivot shaft 24 is inserted into the shaft supporting bore 23, whereby the rotation of the pivot shaft 24 moves the brake shoe 66 to the braking position.

The brake shoe 66 is, as shown in Fig. 10, provided with a rectangular portion 67 and brake portions 68 of substantially right-angled triangle shape disposed integrally on and projecting from both sides of the rectangular portion 67. The rectangular portion 67 has an arcuate surface 69 which fits to the cylindrical portion 18 of the sliding block 16, an arcuate surface 71 which fits to a flange 70 of the pivot shaft 24, and a

cam receiving surface 72 of a flat horizontal shape.

The pivot shaft 24 has circular surface 73, a flat surface 74 which is a partially-cutaway flat portion of the circular surface 73, and a flange 76 at the rear of the flat surface 74 (Fig. 19). A cam face 75 of the pivot shaft 24 is fitted to the cam receiving surface 72 of the brake shoe 66, to move the brake shoe 66 upwardly and downwardly in accordance with the rotation of the pivot shaft 24 (Fig. 7). The flange 76 of the pivot shaft 24 is fitted to the back surface of the cam receiving surface 72 to hold the pivot shaft 24 such that the shaft is permitted only to rotate (Fig. 7).

The brake shoe 66 has an inclined sliding face 77 and a perpendicular brake face 78 (Fig. 10). The sliding face 77 is engaged with an inclined guide face 79 at the inner part of the slot 65 (Fig.5), and the guide face 79 pushes the brake shoe 66 forward as it is being raised, and guides the brake shoe rearward as it is being lowered. The above brake face 78 is present at the inner portion of one of sliding surfaces 80 of the sliding groove 20 of the first sliding block 16 as the brake shoe 66 is moved downwardly (Fig. 5), and is in slight contact with or not in contact with the flange 21 of the side jamb 4 (Fig. 11). When the brake shoe 66 is being raised, the brake face 78 is pushed against the flange 21 of the side jamb 4 to impart a braking force to the first sliding block 16, thereby preventing the up-and-down movement of the sliding block 16 (Fig. 11). By this structure, when the sash 2 is inclined from the vertical position to the horizontal position (Fig. 4), a braking force will be applied to the sash to hold the sash at the horizontal position.

The sashes 1, 2 are provided with locking means at top rails 82,82 to prevent the rotation of the sash

around the pivot shaft 24 by locking the locking means, and permit the rotation of the sash by unlocking the locking means. A locking member 83 as the locking means is provided with a housing 86 comprised of a housing body 84 and a bottom cover 85 for closing the opening at the bottom, a latch 87 slidably inserted into the housing and a compression coiled spring 88 biassing the latch 87 outwardly (Fig. 3 and Fig. 12).

The housing body 84 and the bottom cover 85 are connected with a screw 89, and fastened to the top rail 82 by a screw 90. The latch 87 has an elongated slot 91, a recess 92 and a knob 93. The elongated slot 91 surrounds screws 89, 90 to define the stroke of the latch 87. Into the recess 92, the spring 88 is incorporated, and one end of the spring is engaged with the wall face of the recess 92 and the other end of the spring is engaged with a bent portion 94 of the bottom cover 85 to permit the latch to project.

A front end 95 of the latch 87 is formed into an arcuate shape (Fig. 12) and the front end is fitted to the tube 9 and moves upward and downward with the sashes 1, 2 along the tube as a guide face. The latch 87 is clamped with flanges 21, 21 of the side jamb 4 of the window frame (Fig. 12), to prevent the inclined movement of the sashes 1, 2. The knob 93 projects upward from an elongated slot 96 of the housing body 84 and returns the latch 87 to the retracted position. In such a rearward movement, the latch 87 moves outward from the position at which it engages with the flange 21 of the side jamb of the window frame, whereby it arrives at an unlocked condition to permit the sash 2 inclined.

As a second embodiment of the connecting means between the adjusting shaft 32 and the spiral member 11, as shown in Fig. 13, the adjusting shaft 32 has a slit

100 at the upper end, the lower end of a hook 101 is inserted into the slit, and a cross pin 102 is inserted through an opening 103 of the slit 100 and a transverse opening 104 of the adjusting shaft 32 for connection. The hook 101 is connected to the spiral member 11 with a pin 105 and a pin 106. By this connecting means, the connection and separation of the adjusting shaft 32 and the spiral member 11 can be made readily, whereby the counter balance can be replaced easily.

As a second embodiment of the adjusting means for the torsion force of the torsion spring 15, as shown in Fig. 14, a braking member 107 is formed into a cylindrical roller shape, and two braking members 107 are positioned around the adjusting shaft 32 at equal intervals, and two cam faces 108 surrounding these braking members 107 are formed on the inner surface of the enlarged openings 31a of the first sliding block 16 at equal intervals so that they correspond to the braking members 107. Each of cam faces 108 is formed into an arcuate shape such that the radius increases in the circumferential direction, like the cam faces 51 in the first embodiment. A retainer 109 has a tubular portion 110, and the tubular portion 110 is fitted to the enlarged shaft portion 34 of the adjusting shaft 32 and the enlarged opening 31a of the sliding block 16. The upper end of the tubular portion 110 is engaged with the shoulder portion 37 of the shaft supporting bore 23, and the lower end thereof is engaged with a flange 111 of the adjusting shaft 32 to prevent the upward movement of the adjusting shaft 32 (Fig. 13). The tubular portion 110 has a vertical slot 112 around the circumferential wall, and the braking member 107 of a cylindrical roller is inserted into the slot 112. The retainer 109 has a lever 113 extending in a radial direction from the tubular portion 110, and slides between two stoppers 114, 115 at the bottom surface of the first sliding block 16. When

the lever 113 abuts the stopper 115, the braking member 197 adopts the deepest position of the cam face 108 and is in the neutral condition, wherein the braking member 107 is not pushed against the adjusting shaft 32 and the adjusting shaft 32 is not in the braking condition. When the lever 113 is rotated to the position at which it abuts to the other stopper 114 in the direction opposite to the arrow A, the braking member 107 is pushed by the cam face 108 and imparts a braking force to the adjusting shaft 32. The coiled torsion spring 60 is engaged with the tubular portion 110 of the retainer 109, and one end of the spring is hooked on the side of the retainer 109, and the other end is hooked on the side of the first sliding block 16, whereby a rotation force is always given in a direction of braking of the retainer 109 to retain the braking condition of the adjusting shaft 32. The adjusting means is operated in such a manner as in the first embodiment.

As a third embodiment of the adjusting means for the torsion force of the torsion spring 15, as shown in Fig. 16, each of the arcuate wedge-shaped braking members 50 and the enlarged shaft portion 34 of the adjusting shaft 32 is provided with angled unevenness 117 by which they engage with each other at the contact surface. By this structure, stronger braking force may be obtained.

Next, an arm 118 retaining the window sash 2 in the downwardly and inwardly swung condition will be described.

The window sash 2 slides around the pivot shaft 24 of the first sliding block 16 from the vertical and closed position to the inwardly inclined position (Fig. 18). The sliding block 16 is basically the same as those which have been described, and thus is hung from the spiral member 11 of the counter balance 6. Above the

sliding block 16, a second sliding block 119 is disposed, and these sliding blocks are integrally connected to each other with a connecting flat bar 120 (Fig. 18). The sliding block 16 moves upwardly and downwardly within the guide groove 5 of the side jamb 4 of the window frame, and the second sliding block 119 moves upwardly and downwardly along the flange 21 of the opening of the side jamb 4 (Fig. 19).

An end portion of the arm 118 is pivotally mounted on the second sliding block 119 by a first connecting means, and the other end portion is connected to a mounting plate 122 fixed on the side surface of the window sash 2 in such a relation that it is moved linearly while rotating by way of a second connecting means (Fig. 18). The second sliding block 119 has a rectangular plate portion 123 and leg portions 124 extending from both sides of said plate at a right angle (Fig. 20). Sliding slots 125 formed at the feet of leg portions 124 are slidably fitted to the flange 21 at the opening surface of the side jamb 4 of the window frame, and the second sliding block 119 is moved upwardly and downwardly along the side jamb 4 (Fig. 19). The leg portions 124 slide on wall portions 126, 127 of the guide groove 5, whereby the up-and-down movement of the second sliding block 119 may be made more smoothly (Fig. 19). The upper end of the strip-like connecting flat bar 120 is fixed to the plate portion 123 with rivets 128, and the lower end of the connecting flat bar is fixed to the rectangular portion 17 of the sliding block 16 with rivets 129 (Fig. 18), whereby the first and second sliding blocks 16, 119 are integrally moved upwardly and downwardly as described above.

The mounting plate 122 has a rectangular raised plate portion 130 and, at both ends, leg portions 131 each formed into a shape having a difference in level,

wherein leg portions 131 are fixed to the side stile 27 with screws 132 in such a manner that the longitudinal direction of the raised plate portion 130 is directed toward the longitudinal direction of the side stile 27 of the window sash (Fig. 18).

The first connecting means used for pivotally mounting in a detachable fashion one end of the strip-like arm 118 on the second sliding block 119 is provided with a first pin 133 standing on the plate portion 123 of the sliding block 119, a first opening 134 bored at one end of the art 118, being detachably fitted to the pin 133, and a clip 135 for preventing the disengagement of the first opening 134 from the pin 133 (Fig. 20).

The pin 133 has an annular groove 136, and when the pin 133 passes through and projects from the first opening 134, the annular groove will be present at such a position that it comes out of the first opening 134. The clip 135 is slidably disposed on the arm 118 with its holding portion 137, and has, at the end, a circular partial opening 138 of more than 180 degrees (Fig. 20). As the clip 135 proceeds forward, the partial opening 138 is engaged with the annular groove 136 of the pin 133 to retain the connection of the pin 133 with the arm 118, and when the clip 135 moves rearward, the partial opening 138 will be disengaged from the groove 136 to disconnect the arm 118 and the pin 133.

In Fig. 20, the arc of the partial opening 138 exceeds 180 degrees, and the size of an opened portion 139 of the partial opening is smaller than the diameter of the annular groove 136 of the pin 133. When the partial opening 138 is pushed into the annular groove 136 for engagement, the engaged condition will be maintained. When an elongated slit 140 is communicated with the partial opening 138, the opened mouth portion 139 of the

partial opening 138 can be resiliently enlarged readily, whereby attachment and detachment of the clip 135 to the pin 133 is made easily. The clip 135 further has part-hemispherical raised portions 141, 141 at the rear end, and strip-like bent portions 142, 142 bending downwardly. By pushing the raised portion 141 with the head of a screwdriver, the clip 135 is moved forwardly or rearwardly, and by inserting the bent portion 142 into an elongated slot 143 of the arm 118, the clip 135 will not be separated from the arm 121.

The second connecting means used for connecting the other end of the arm 118 to the mounting plate 122, has a second pin 144 standing on the arm 118, and an elongated vertical slot 145 which is bored in the raised plate portion 130 of the mounting plate 122 and is to be fitted to the pin 144. The pin and the slot proceed linearly while rotating relatively (Fig. 18).

The arm 118 slides around the pin 133 in accordance with the slidable movement around the pivot shaft 24 of the sash 2. When the sash 2 is opened inwardly in an inclined condition, the pin 144 abuts the lower end of the elongated slot 145 thereby retaining the sash at that position. When the sash 2 is closed from that position to the vertical position, the pin 144 moves toward the upper end of the elongated slot 145 along the elongated slot, and the arms 118 are folded such that they are parallel with the both sides of the sash 2.

In the counter balance 5, the braking means preventing the up-and-down movement thereof may be omitted.

CLAIMS:

1. A window comprising a window frame having a head and a sill which are oppositely disposed, and side jambs which are oppositely disposed; a window sash which slides upwardly and downwardly along the side jambs of the window frame; a counter balance having a coiled torsion spring which counter-balances with the window sash and keeps the window sash at a desired position; a first sliding block which connects the counter balance to the window sash and slides upwardly and downwardly along the side jambs of the window frame; and an adjusting means which is incorporated in the first sliding block and adjusts the counter balancing force of the torsion spring;

wherein the adjusting means comprises an adjusting shaft, a braking member disposed around the adjusting shaft and a cam face disposed around the braking member, so that the adjusting shaft adjusts the counter balancing force by torsioning the torsion spring, the braking member maintains the counter balancing force by applying a braking force to the adjusting shaft, and when the braking member rotates around the adjusting shaft in a circumferential direction, the cam face applies a braking force by pushing the braking member against the adjusting shaft and releases the braking force by separating the braking member from the adjusting shaft.

2. The window according to Claim 1, wherein the adjusting shaft is rotatably inserted into a vertical opening of the first sliding block, the cam face is formed at a lower portion of the vertical opening, the braking member is formed in an arcuate wedge shape and inserted between the adjusting shaft and the cam face, and stands on a rotation ring slidably engaged with the adjusting shaft, said rotation ring is provided with a

lever which rotates with the rotation ring in a direction releasing the braking force, and the adjusting means includes a spring which biases the rotation ring in a braking direction.

3. The window according to Claim 2, wherein a plurality of braking members are disposed such that they surround the adjusting shaft, and a plurality of cam faces are disposed such that they correspond to the plurality of braking members.

4. The window according to Claim 3, wherein the cam faces in the vertical opening of the first sliding block and the faces of the braking members being in contact with the cam faces are formed into such an arcuate shape that the radius increases in a circumferential direction.

5. The window according to Claim 4, wherein each of the braking members and the adjusting shaft have gears (teeth) engaging with each other at the contact face thereof, so that the braking force of the braking member against the adjusting shaft is secured by the engagement of the gears.

6. The window according to Claim 1, wherein the braking member is formed in a cylindrical roller shape.

7. The window according to Claim 6, wherein the adjusting shaft is rotatably inserted into a shaft receiving bore in the vertical direction of the first sliding block, and the came face is formed within the shaft receiving bore, the braking member is inserted between the adjusting shaft and the cam face, the adjusting means includes a tubular retainer fitted to the adjusting shaft, said retainer has a bore retaining the braking member and a lever turning the retainer in a direction releasing the braking force, and the adjusting

means has a spring biasing the retainer in a braking direction.

8. The window according to Claim 7, wherein a plurality of braking members are disposed such that they surround the adjusting shaft, and a plurality of cam faces are disposed such that they correspond to the plurality of braking members.

9. The window according to Claim 8, wherein the cam face of the shaft supporting bore of the first sliding block is formed into an arcuate shape such that the radius increases in a circumferential direction.

10. The window according to any of Claims 1 to 9, wherein the counter balance further comprises a tube fixed to the side jamb of the window frame, and surrounding the torsion spring and being fixed to the upper end of the torsion spring, a nut connected to said tube such that only rotation is possible, and fixed to the lower end of the torsion spring, and a spiral member which is inserted into the torsion spring in such a manner that the spiral member is slidable upwardly and downwardly, screwed in the nut, and rotatably connected to the adjusting shaft integrally, so that the spiral member winds the torsion spring by way of the nut during downward moving and is raised by the unwinding force of the torsion spring by way of the nut.

11. The window according to Claim 10, wherein the connection between the spiral member and the adjusting shaft is made by the engagement between a hook connected to the adjusting shaft and a pin connected to the spiral member.

12. The window according to Claim 11, wherein the adjusting shaft comprises a slot at the bottom surface

for insertion of the head of a screwdriver so that the shaft is rotated by the screwdriver in a direction increasing the torsion force of the torsion spring.

13. The window according to Claim 10, wherein the first sliding block has a braking means incorporated therein which prevents automatically the up-and-down movement of the first sliding block when the window sash rotates from a vertical position toward a horizontal position by a predetermined angle around a horizontal shaft.

14. The window according to Claim 13, wherein the braking member of the first sliding block comprises a pivot shaft incorporated in the first sliding block and connected to the window sash, and a braking member which applies braking force to the sliding block in accordance with the rotation of the pivot shaft when the window sash is inclined from the vertical position toward the horizontal position.

15. The window according to Claim 14, wherein the pivot shaft has a cam face and the braking member has a cam receiving face for receiving the cam face such that the cam face and the cam receiving face move the braking member upwardly and downwardly in accordance with the rotation of the pivot shaft; the first sliding block has a slant guide face; and the braking member further has a sliding face which slides slantingly on the guide face such that the guide face and the sliding face move the braking member reciprocally in a horizontal direction between the braking position at which the braking member is pushed against the side jamb of the window frame, and the position at which the pushing is released, in accordance with the up-and-down movement of the braking member.

16. The window according to Claim 15, wherein the

window further comprises a locking means disposed on the top rail of the window sash, which prevents the inclined movement of the window sash and holds the window sash at a vertical position.

17. The window according to Claim 16, wherein the locking means comprises a housing fixed to the top rail of the window sash, a locking member slidably incorporated in the housing, and a spring biassing said locking member toward a projection position, wherein the locking member has a face slidably engaged with the tube such that the locking member slides on the tube of the counter balance as a guide face, and achieves the locked condition by being clamped with a guide groove of the side jamb of the window frame.

18. The window according to Claim 10, wherein the window comprises a second sliding block connected to the first sliding block, which slides upwardly and downwardly along the side jamb; mounting plates fixed at both sides of the window sash; an arm having one end being connected to the second sliding block by way of a first connecting means, and the other end being connected to the mounting plate by way of a second connecting means, so that the inclined angle of the window sash toward the inside is restricted; the first connecting means connects the arm to the second sliding block in a rotatable and detachable fashion, and the second connecting means is connected such that it moves linearly while rotating the arm relative to the mounting plate.

19. The window according to Claim 18, wherein the first connection means comprises a first connecting opening bored at the end of the arm, a first pin being fixed to the second sliding block and passing through the first connecting opening, and a detachable clip being detachably connected to the first pin and preventing the

disengagement of the arm from the first connecting opening, wherein the second connecting means has an elongated second connecting opening bored at the mounting plate and a second pin being fixed to the other end of the arm and engaged with the elongated opening in such a manner that it is rotatable and linearly moveable.

20. The window according to Claim 19, wherein the detachable clip is slidably disposed on the arm, so that a partial opening disposed on the clip is engaged with an annular groove formed on the first pin of the second sliding block when the detachable clip moves forward, and acts to prevent disengagement of the first pin with the first connecting opening, and when the detachable clip moves rearward, the partial opening is detached from the annular groove of the first pin, whereby the prevention of relative disengagement between the first pin and the first connecting opening is released.

21. The window according to Claim 20, wherein the first sliding block and the second sliding block are connected by way of a connecting member, the first sliding block is hung by means of the counter balance and supports the pivot shaft, a supporting arm connected to the pivot shaft is detachably disposed to the lower end of the window sash, and the second sliding block supports the first pin.

22. A window substantially as herein described and as illustrated in any of he accompanying drawings.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

Application number: GB 9216838.4

Relevant technical fields

(i) UK Cl (Edition K) E1J: JFA

(ii) Int Cl (Edition 5) E06B

Search Examiner: J ROWLATT

Databases (see over)

(i) UK Patent Office

(ii)

Date of Search: 22 DECEMBER 1992

Documents considered relevant following a search in respect of claims 1-22

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
	NONE	

Category	Identity f document and relevant passages	Relevant to claim(s)

Categories of documents

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